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THE GROUP OF ELEOCHARIS PALUSTRIS IN NORTH AMERICA

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KEY TO THE *E. PALUSTRIS* GROUP IN NORTH AMERICA

- a. Basal scales of spikelet solitary and spatiform, completely encircling the base of the spikelet. . . . b.
- b. Achenes prominently reticulate-pitted. . . . c.
- c. Tubercle ovoid, nearly equalling to larger than the achene; spikelets castaneous to purplish. Sea coasts, Alaska to northern Quebec. . . . *E. kamtschatica*
- c. Tubercle pyramidal, much smaller than the achene; spikelets castaneous. Near the coast, Massachusetts to Louisiana; Cuba. . . . *E. fallax*
- b. Achenes smooth to faintly reticulate. . . . d.
- d. Culms elongate-filiform, spikelets 30-40-flowered with obtuse scales; tubercle conic, only 0.2-0.45 mm. wide at base. Western New England to margin of Great Plains. . . . *E. calva*
- d. Culms usually thicker, frequently inflated or rigidly flattened. . . . e.
- e. Spikelets few-flowered, the 5-30 scales usually lustrous purple; tubercle conic, only 0.2-0.4 mm. wide at base. Sea coasts, Hudson Bay to Virginia. . . . *E. halophila*
- e. Spikelets frequently many-flowered, scales stramineous to purplish; tubercles conic to lanceolate. Western North America. . . . *E. macrostachya*
- a. Basal scales of spikelet usually 2 or 3 below the thinner fertile scales, the lowest not encircling the base of the spikelet. . . . f.
- f. Tubercles depressed-deltoid, scales acuminate, and culms wiry in southern part of the range; the entire plant becoming soft with elongate tubercles northward. Newfoundland to Alabama, west to the Mississippi River. . . . *E. Smallii*
- f. Tubercles depressed-deltoid to lanceolate; culms variable. Western North America. . . . *E. macrostachya*

Note: *E. palustris* of recent authors (as to American plants) is here included under *E. Smallii* and *E. macrostachya*.

E. PALUSTRIS. The standard account of this species has been that of Lindberg, *Acta Soc. Fauna et Flora Fennica* **23**, no. 7: 16. 1902, in which three species were segregated in northern Europe, essentially as follows:

1. Achene obovate, the conic tubercle sharply differentiated from the achene and higher than broad. *Scirpus (Heleocharis) eupaluster*.
2. Achene light brown, rounded, the thickened tubercle almost sessile (i. e. slightly confluent), tubercle broader than high. *S. (Heleocharis) mamillatus*.
3. Spikelets uniglumate, achene dark brown, obviously punctate, the thickened tubercle broader than high *S. (Heleocharis) uniglumis*.

As pointed out by me in *RHODORA* **41**: 57. 1939, *Eleocharis palustris* in northern Europe is frequently intermingled with uniglumate plants without other differences. The specimen of *E. palustris* in the Linnaean Herbarium is *E. mamillata* Lindberg, and so annotated by him. As to the ribbonlike and terete (at least in dried material) culms differentiating *E. mamillata* and *E. palustris* respectively, I can see in this feature only environmental influence. The achenes of the *E. palustris* group in northern Europe are more coarsely cellular-reticulate and the tubercle broader at the base, with a tendency to be less distinct from the body of the achene than in North American material. From these points of view I think the species of Europe can be maintained as distinct from American representatives of the group. *E. uniglumis* is, I believe, only an ecological variant in brackish water; achenes with similar punctate achene-surface are occasional in fresh-water lakes. And finally, the higher-than-broad tubercle seems to be only an indication of the increasing softness of tissues which one finds in aquatics of high northern latitudes, and which I suspect may be associated with the fast but short growing period. Such soft plants, in the extensive European collection of *E. palustris* which Dr. Samuelson gave me, seem to be characteristic of the northern parts of Scandinavia. Diminutive representatives collected by Carl Alm in Lule Lappmark are almost identical in appearance with *Fernald, Long, & Fogg* 1339 from Bay of Islands, Newfoundland, though the tubercle is subulate in much of the Newfoundland material. These northern plants seem to me to be modifications, with less rigid tissues, of the southerly plants—in Europe of broad-tubercled *E. palustris*; in eastern North America of *E. Smallii*.

First of all, I see no value in differentiating as species the ecological variants of northern European *E. palustris*, namely *E. palustris*, *E. mamillata* and *E. uniglumis*. They intergrade freely and the distinctions are of the most academic character. If necessary to distinguish them in the literature, the present designations can be employed or they can be designated informally—it makes little difference. In Europe there are quite evidently additional variations, such as the dwarf plants represented by collections from Rumania, with small achenes and broad tubercles. Perhaps these are connected with the variations of *E. palustris* in western Asia.

To return to North America: the complexities of *E. macrostachya* of western United States have already been discussed by me in RHODORA 41: 55–59. 1939, and the considerable amount of material which has been submitted to me for identification since that time, has merely strengthened the opinions which I had formed. I believe that this species is comparable with *E. palustris* of Europe in respect to the labile uniglumate condition, and in the frequent darkening of scales where the plant is in contact with maritime conditions. *E. macrostachya* occupies the entire range of western states, extends southward into northern Mexico, and ranges north to 59° (*Raup* 1972) in the region of Great Slave Lake in northern Canada. It reaches eastward to western Minnesota, Ortonville (*Moyer* in 1898, hb. Univ. of Minnesota); Iowa (Palo Alto and Clay Counties); and western Missouri. The boundary of *E. macrostachya* to the northeast is unknown and the chief remaining problem of the *palustris*-group in North America is the relationship of *E. macrostachya* to the contiguous *E. Smallii* of northeastern North America.

I think that the two species are distinct—at least no decision should be made to unite these two recognized representatives of the flora of eastern and western North America until the material can be studied very closely at the points of contact. Fortunately Dr. Ada Hayden has supplied me with good collections from Iowa, which I have mentioned as one of the contact points of the two species.

ELEOCHARIS SMALLII Britton was described from the Susquehanna River at Harrisburg, Pennsylvania. The culms were of extraordinary thickness and much wider than the spikelet.

The species was differentiated from the European *E. palustris* in Torrey **3: 23**, figs. 1-2. 1903, and, also by the bulbiform base of the tubercle, in Britton and Brown, Ill. Fl. ed. 2, **1: 310**. 1913, as follows:

Scales pale green to straw-color	<i>E. macrostachya</i>
Scales brown to purple-brown.	
Tubercle flattened-conic; spikelet thicker than culm	<i>E. palustris</i>
Tubercle swollen, bulb-like; spikelet not thicker than the culm	<i>E. Smallii</i>

Fernald and Brackett in 1929 recognized *E. Smallii* as a widespread plant, which had slender as well as thickened culms. I would go a step further and include practically all the material now recognized as *E. palustris* in eastern North America, under the name *E. Smallii*. In the southern part of its range, this species is characterized by the bulbiform base of the tubercle which becomes "depressed-deltoid, umbonate or broad-ovate, as broad as or broader than long" (Fernald and Brackett, p. 59). The wiry culms, firm black-bordered sheath-apex, and hardened acuminate scales also distinguish this species from *E. calva*. There seems to be no transition to the uniglumate *E. halophila* of the Atlantic coast. When the zone of the Canadian Forest is reached northward, the texture of *E. Smallii* becomes softer and the tubercle tends to lose its bulbous character, reaching a linear-subulate form in some of the collections at the northern limit of range. These changes are shown in the illustrations of *E. Smallii* and "*E. palustris*", RHODORA pl. 181 and 182. 1929; and especially the photograph, RHODORA pl. 547, where "*E. palustris*" from Nova Scotia is shown (fig. 21) in its transitional stages. Such material extends to Hudson Bay, where it approaches slender material of the western *E. macrostachya* in its appearance. Whether there is any actual connection with *E. macrostachya* across the Canadian wilderness from Manitoba to Hudson Bay cannot be determined until collections are known from that region. From *E. Smallii*, as well as *E. macrostachya*, typical *E. palustris* of Europe differs in the much coarser style and style-branches, in the generally larger achenes with broader, nearly sessile tubercles, and a decided reticulation of the achene-surface.

It is now of importance to find points at which the rigid form of *E. Smallii* with the bulbiform tubercles gives way to the soft

plant with elongate tubercles and soft scales. That is not so easy, for in Newfoundland both forms are found. *Fernald & Wiegand* 27,520 from St. John Bay is a fine example of the narrow-tubercled form. In this collection the body of the achene is 1.8–2.0 mm. long and 1.0 mm. wide; the tubercles vary from 0.3 x 0.5 mm. to 0.25 x 1.0 mm., i. e. the linear tubercle may be four times as long as wide. *Fernald & Wiegand* 2702 from Ingornachoix Bay shows intermediate tubercles. It has the identical outward appearance and achene-body of *Wiegand & Hotchkiss* 27,521 from St. Barbe Bay in northwestern Newfoundland, a collection which has elongate tubercles. On the diorite table-land of the Blomidon Mts. and in similar places, the form of *E. Smallii* with short tubercles characteristic of the southern part of the range, is abundant.

In Quebec the long-beaked extreme of *E. Smallii* is occasional, such as the following collections: Bic, Rimouski Co. *Fernald & Collins* 922; Little Metis, Matane Co. *Fowler*; Cap Chat, Matane Co. *Fernald & Smith* 25,496; Madeleine Pt., Gaspé Co. *Kelsey & Jordan* 24; Magdalen Islands, *Marie-Victorin & Rolland-Germain* 9352; New Richmond, Bonaventure Co. *Collins & Pease* in 1904.

The fine collections assembled by E. C. Ogden in western and northern Main frequently show tubercles which are very slightly higher than broad. These plants quite evidently represent the beginnings of the transition phase. From Rev. Lepage I have received numerous collections from the east side of Ungava Bay, 52–54° N. Some mature specimens, such as *Dutilly & Lepage* 12,644, are of the narrow-tubercled form; others, such as 12,645, have broad tubercles. Some of these plants are definitely uniglumate, and it is possible, as I mentioned previously, that they may be a continuation of the uniglumate forms of *E. macrostachya*, found along the Pacific coast from Puget Sound northward. Too little mature material is known from the Hudson Bay region and from the Canadian Pacific coast.

Polunin, Journ. Linn. Soc. London **52**: 367. 1943, cites *E. palustris* from southwest Greenland (Kiagtut and Igaliko) approximately 60–61° N., saying "These are *E. uniglumis*: many of the culms exceed 50 cm. in height and 2 mm. in breadth when pressed; seems nearer to *E. palustris*." Whether these are the European or the American plant I do not know.

E. FALLAX Weatherby, RHODORA **24**: 23. 1922. *E. nervosa* Kuekenthal, Rep. Spec. Nov. **23**: 192. 1926. *E. ambigens* Fernald, RHODORA **37**: 394. 1935. References have been made by me to these plants in RHODORA **41**: 64. 1939, but I had not then the solution to the problem. *E. fallax* was described from a single colony (or plant?) on Cape Cod, Massachusetts: "It has the aspect and entire sheaths of the group of *E. palustris*, but is at once distinguished therefrom by its three-parted styles and bluntly trigonous achenes. It combines some of the characters of *E. capitata* (*E. tenuis*) and *E. arenicola*." *E. ambigens*—the name signifying its relationship to two groups—extends from Massachusetts to Louisiana along the coast. Because of the wrinkled achene-surface, it was very early confused with *E. compressa*. The dark red lucid sheaths are quite characteristic. Dissection of spikelets of the *palustris*-group will disclose occasional 3-parted styles. I have seen them in *E. kamtschatica* (Lepage & Dutilly 12,313 from Ungava, and Anderson 852 from Alaska); in *E. Smallii* (Lepage & Dutilly 12,644 from Ungava); and in *E. palustris* (Fröding from Vermland, Sweden). In *E. ambigens* 3-parted styles are relatively more frequent; one or two in each spikelet examined from Fernald, Griscom & Long 4568, but approximately 50 per cent in the spikelets of Smith & Hodgdon 621, both collections from Virginia.

E. KAMTSCHATICA (C. A. Meyer) Komarov; Fernald & Brackett, RHODORA **37**: 395. 1935. This Asiatic species, with the tubercle often as large as the body of the achene and with the achene-body strongly reticulate-pitted, has been known from Alaska. It now appears on Hudson Bay, and in two localities on the Atlantic Coast, and is represented by the following collections: Hudson Bay, Burke (G) (labeled as *E. palustris* var. *Watsoni* by N. L. Britton); east coast of Hudson Bay, Ungava, Quebec, 52–54° N. Dutilly & Lepage nos. 13,408, 13,556, 13,356 and (?) 13,408; Paradise River, Labrador, (53° 30' N.) Bishop 101 (G); R. Romaine, north coast of Gulf of St. Lawrence, Quebec, Marie-Victorin & Rolland-Germain 20,165 (G). This species has been the basis of some of the reports of *E. uniglumis* in eastern North America; on the other hand, some cited collections such as Fernald & Wiegand 2706 from the mountains of Newfoundland are not uniglumate at all, and to my mind are perfectly typical *E. Smallii*.

E. CALVA Torrey. This is a plant with filiform culms, and many-flowered spikelets, predominantly of calcareous areas of northeastern United States. It extends from Quebec and western New England to Virginia and Tennessee, west now to Minnesota where it is abundant; eastern North Dakota (Butte, *Lunell* 789); northeastern Nebraska (*Clements* 2552 from lowlands of Missouri River); northwest Iowa (*Hayden* 8247, Buena Vista Co.); Missouri (Jackson Co., *Bush* 58); and Oklahoma (Ottawa Co., *G. W. Stevens* 2431). All material to the west of this area appears to be the coarser *E. macrostachya*, which is frequently uniglumate.

E. SMALLII Britton. Extends southward to Delaware, West Virginia, and in the Cumberland Mountains to Tennessee (Norris Reservoir, *Hess & Penfound*, July 14, 1938; Dunlap, *Svenson* 10,113) and northern Alabama (Muscle Shoals, *T. F. Hall*, June 21, 1938). To the westward it enters Wisconsin (including *Fassett* 16,739 from Drummond); extends through much of northern Minnesota and reaches western Iowa and Missouri.

E. HALOPHILA This few-flowered uniglumate plant of the Atlantic seacoast extends from Hudson Bay to Virginia.

BROOKLYN BOTANIC GARDEN,
BROOKLYN, N. Y.

VERBASCUM PHLOMOIDES IN IOWA

W. A. ANDERSON

(Plate 1055)

Verbascum phlomoides L. is by far the commonest mullein around Iowa City. It has been here for at least thirty-five years, as shown by herbarium specimens, though published accounts are very recent (1) (2). In an attempt to account for the disparity between descriptions in current manuals (3) and the plant as seen in the field, the writer has been watching colonies of mullein for the past three seasons and has come to the following conclusions:—

The mature form of *Verbascum phlomoides* is a gigantic weed, 1.5 to 2 m. high, shooting from a large winter rosette into flower-